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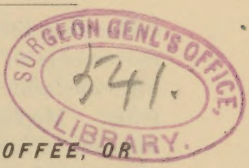


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WHEN coffee is roasted an empyreumatic oil is developed which is supposed to impart to it new physiological properties. The actions of this substance have been studied chiefly by means of a distillate obtained from a strong infusion of coffee; by a comparison of the effects produced by the use of preparations of raw and roasted coffee; or by the administration of the pure oil.

In experiments on three individuals Lehman[1] found that the distillate from roasted coffee caused nervousness and slight sweating, and acted on the brain, affecting the mental faculties rather than the imagination. The solid constituents of the urine, such as urea, were diminished to a greater extent than by caffeine. After large doses there occurred congestion, profuse sweating, and sleeplessness. In two instances diarrhœa was noted. Nasse,[2] in experiments on animals, states that when he injected a few drops of a strong infusion of freshly roasted

[1] Annal d. Chemie u. Phar., 1853, Bd. 87, S. 275.
[2] Beiträge z. Physiologie d. Darmbewegung, Leipzig, 1866, S. 66.

coffee into the jugular vein of a rabbit, peristaltic movements of a decided character occurred in the intestines which he was unable to produce with caffeine. Méplain[1] obtained from a litre of strong infusion of coffee 200 grammes of a liquid which possessed the aromatic odor of roasted coffee and a slight bitter taste. After the ingestion of this the pulse was increased from 64 to 74 per minute, arterial tension was diminished, and the face congested. Marvaud (*ibid.*) obtained similar results. Rabuteau[2] states that he has "recognized in caffeone the exciting properties attributed to coffee. Everybody knows that an infusion of coffee hinders sleep, but that this effect is not invariably present. We have wrongly attributed this difference in action to idiosyncrasy, but it is due to a difference in the composition of the coffee, for while an infusion of coffee containing caffeone prevents sleep, the same effect is not produced by the ingestion of an infusion which has been freed from caffeone by prolonged boiling, or by that which has been prepared from coffee too much roasted, or from green coffee, or which contains a small quantity of the particular substance which gives coffee its peculiar odor." He also found that caffeone possesses decided toxic properties, and prevents the development of low organisms in organic fluids. Binz,[3] in experiments on three dogs with a distillate, obtained results in some respects opposed to those already recorded. The

[1] Les Aliments d'Epargne, 2 ed., Paris, 1874, p. 305.
[2] Compt. rend., lxxi. p. 733.
[3] Archiv f. Exper. Path. u. Phar., ix. S. 45.

distillate, he states, was of a light golden color, of a very aromatic odor and taste, and cloudy when cold. In one experiment a dog, weighing 720 grammes, was given by the stomach 25 c.c., representing the one-half of the distillate from 22 grammes of coffee, in 150 c.c. of hot water. No phenomena were observed, except a quickening of the heart-beats from 110 to 145 per minute. In another experiment with a dog, weighing 1790 grammes, and drunk with alcohol, 12 c.c. of a distillate from 16 grammes of coffee in 1 litre of water were injected subcutaneously in two places. In six minutes the respiration rate was doubled in depth and frequency. In the last experiment the dog weighed 1840 grammes, and was completely narcotized with alcohol. Before giving the caffeone the arterial pressure was 76 mm. of mercury and the pulse 39 in fifteen seconds. Twenty c.c. of a distillate of 85 c.c., which was obtained from 20 grammes of roasted coffee in 100 c.c. of water, were injected subcutaneously, and 50 c.c. given by the stomach. In ten minutes the pressure fell to 68 mm.; in fifteen minutes, to 66 mm., and in forty minutes, to 56 mm. The force of the pulse was doubly strong, and the heart-beats increased in frequency. The diminution of blood-pressure he consequently attributes to vascular dilatation.

It is obvious that in the investigations above referred to, the actual quantities ingested of the so-called caffeone were not known; it therefore occurred to Hare and Marshall[1] to isolate this sub-

[1] THE MEDICAL NEWS, 1888, vol. lii. p. 337.

stance and study the effects of definite doses. They extracted the oil with pure petroleum ether, and allowed the latter to evaporate spontaneously. The product thus obtained was of the consistency of dilute syrup, varying in color from a light to a dark brown, according to the color of the seeds, and possessing to a great degree the peculiar aroma of roasted coffee. When injected into the jugular vein of a dog the pulse was for a short time increased and then diminished, and the arterial pressure was lowered. If the dose was sufficient to kill, the heart-beats became slower and slower, arterial pressure gradually fell, and the heart was arrested in diastole. The asserted antisoporific properties attributed to caffeone led them to make one experiment on a dog and three on men, in each of which single doses of from 50 to 60 minims were given by the stomach. In the dog and in two men sleep occurred and in one case sleeplessness.

The investigations of Hare and Marshall I have recently supplemented and extended during the progress of a study with caffeine. The oil was prepared in the same manner, and the results obtained from its intravenous injection in dogs were identical. It seemed to me, however, that an oil of such consistency, and which is practically insoluble in the blood, would, when thrown directly into the circulation, mechanically clog up the capillaries in the nerve-centres and elsewhere and thus give rise to serious disturbances. Therefore, in another series of experiments, I substituted for the oil of coffee pure olive oil and obtained similar results. In a third series, in order also to obviate these mechanical

effects, the oil of coffee was given subcutaneously in amounts varying from 1 c.c. to 3 c.c. per kilo of body-weight, but without any effect on the heart-beat, arterial pressure, cerebral functions, respiration, or heat phenomena. It is, therefore, conclusive that the empyreumatic oil of coffee, as obtained by Hare and Marshall, is inert.

The positive results recorded by various observers following the ingestion of a distillate from roasted coffee, the evident differences in the activities of infusions prepared from raw and roasted coffee, the change in the properties of the infusion of roasted coffee which occurs from continued boiling or in the seeds by excessive roasting, certainly lead to an inevitable conclusion that some volatile principle is developed during the roasting which is dissipated by prolonged heating and which possesses definite physiological properties. It would, therefore, naturally be inferred that such a substance would pass over in the early distillate from a strong infusion of coffee. I consequently prepared a distillate by placing 500 grammes of freshly roasted coffee in a Florence flask, adding sufficient water to cover it, and collecting the first 200 c.c. distilled. This was of a pale yellow color, slightly turbid, bitter, and had the strong aromatic odor of roasted coffee. A small dog, weighing 6 kilos, whose carotid was connected with the kymographion, was given, by means of the external jugular vein, within ten minutes, 105 c.c. of this distillate in doses of 10 c.c., but without any definite effect on arterial pressure, pulse, respiration, bodily temperature, or otherwise. A similar distillate was prepared from other samples

of coffee, but all were inert, although appropriate tests demonstrated the presence of organic matter. The opposite results obtained by different observers and myself, lead to the belief that this hypothetical principle is more volatile in some samples of coffee than in others. Whatever may be its nature, it is clearly not identical with the empyreumatic oil which is so abundant in roasted coffee.

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